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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/583,444	06/25/2007	Stefan Spiekermann	1003301-000276	9058

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BUCHANAN, INGERSOLL & ROONEY PC  
POST OFFICE BOX 1404  
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EXAMINER
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FORDE, DELMA ROSA

ART UNIT	PAPER NUMBER
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2828

NOTIFICATION DATE	DELIVERY MODE
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12/17/2008

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ADIPFDD@bipc.com

<b>Office Action Summary</b>	<b>Application No.</b> 10/583,444	<b>Applicant(s)</b> SPIEKERMANN ET AL.	
	<b>Examiner</b> DELMA R. FORDE	<b>Art Unit</b> 2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 14 October 2008.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 8 and 18 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 3 - 7, 9-11, 10, 13 - 17 and 19 - 20 is/are rejected.
- 7) ☒ Claim(s) 2 and 12 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

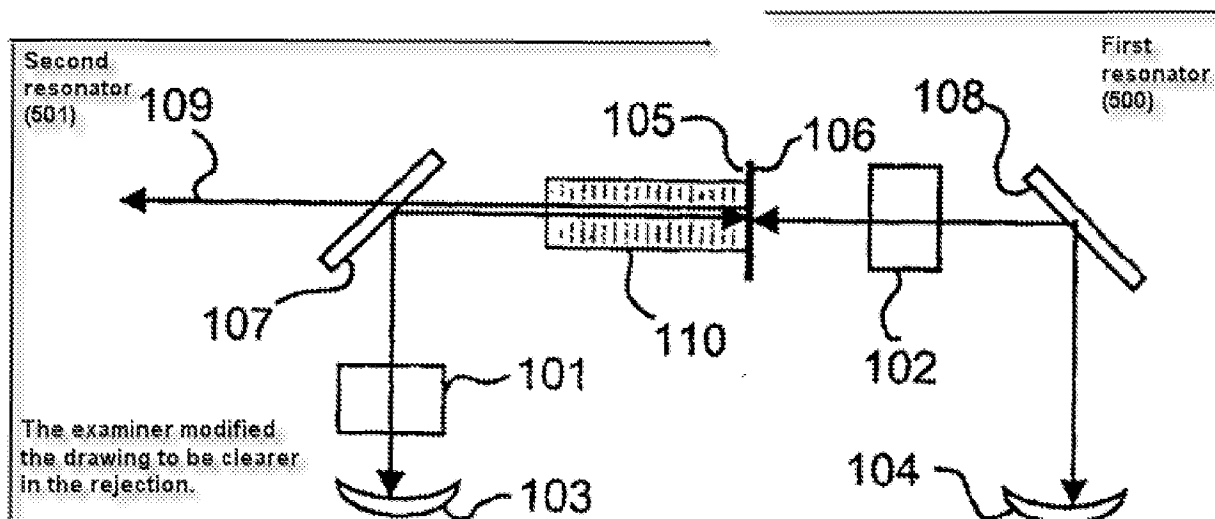
## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3 – 7, 9 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spiekermann (WO 02/103863) in views of Wu et al (5,278,852).



**Regarding claim 1**, Spiekermann shown on Figure 1, discloses a laser arrangement, comprising: a first resonant laser cavity (500); a first optically pumpable

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gain element (102) located within said first cavity (500) for generation of a first fundamental wavelength; a second resonant laser cavity (501); a pump source (page 6, lines 21 – 28 and Page 12, lines 34 – 36) arranged to optically pump gain element (101 and 102); a first non-linear optical region (110) arranged for sum-frequency mixing (Page 10, Lines 15 – 37 and Page 11, lines 1 – 10) of the radiation generated in said first resonant cavity (500) and the radiation generated in said second resonant cavity (501).

Spiekermann discloses the claimed invention except for a second non-linear region and second non-linear optical region arranged for frequency doubling. Wu teaches a second non-linear region and second non-linear optical region arranged for frequency doubling. However, it is well known in the art to apply second non-linear region and second non-linear optical region arranged for frequency doubling as disclosed by Wu in Figure 3, Column 1, Lines 40 – 66 and Column 2, Lines 44 – 48. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was to apply the well known second non-linear region and second non-linear optical region arranged for frequency doubling as suggested by Wu to the laser of Spiekermann, because it could be used to operate on the fundamental laser beam present within the resonating cavity (which is one to two orders of magnitude higher than the fundamental beam outside of the cavity). By accessing, and operating on, the fundamental laser beam within the resonating cavity, the frequency conversion efficiency is increased, thereby giving rise to the generation of more powerful harmonic

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frequencies. The nonlinear crystals are inserted in the laser resonator in order to obtain third, fourth or even higher harmonic output.

There are N nonlinear crystals ( $N \geq 2$ ) between the laser active medium and the output coupler mirror. Among them, the crystal which is nearest to the laser active medium is a frequency doubling crystal which converts the fundamental wavelength to the second harmonic wavelength. The other crystals act as frequency mixing or frequency doubling devices depending on the desired harmonic to be output. When a nonlinear crystal is inserted in the resonator, the conversion efficiency of the nonlinear process is greatly increased by the intense fundamental laser beam inside the resonator. By this means, the CW high order harmonic output is realized. This method is also applicable in low peak power pulse laser system to further increase the output of the high order harmonic laser beam (see Figure 3, Column 1, Lines 40 – 66 and Column 2, Lines 44 – 48 of Wu).

**Regarding claims 3 and 4**, Spiekermann discloses the claimed invention except non-linear optical regions comprises a quasi-phasesmatching grating (Page 6, lines 29 – 37 and Page 7, lines 1 – 32).

**Regarding claim 5**, Spiekermann discloses a gain elements (101 and 102) is an optically pumpable semiconductor element (Page 6, lines 21 – 28 and Page 12, lines 34 – 36).

**Regarding claims 6 and 7**, Spiekermann discloses a gain elements is an Nd-doped solid-state element selected from Nd:YVO<sub>4</sub>, Nd:YAG, Nd:YLF, Nd:GVO.sub.4, and Nd:Glass (page 9, table 1 and lines 4 - 22) .

**Regarding claims 9 and 11**, Spiekermann discloses non-linear optical region are constituted by a periodically poled crystal of KTP (Page 13, Lines 13 – 21).

Claims 10, 13 – 17 and 19 – 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spiekermann (WO 02/103863) in views of Wu et al (5,278,852) further in view of Byer et al. (4,739,507).

**Regarding claims 10, 13 – 17 and 19 – 20** Spiekermann discloses the claimed invention except dielectric coating. Byer teach a dielectric coating. However, it is well known in the art to apply dielectric coating as discloses by Byer in Column 3, Lines 31 - 56. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was to apply the well known dielectric coating as suggested by Byer to the laser of Spiekermann because could be use that material can provide a reflectivity greater than 99.5 % , (see Column 3, Lines 31 – 56 of Byer).

#### ***Allowable Subject Matter***

Claims 2 and 12 are objected to as being dependent upon a rejected base claim,

but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claims 2 and 12 recites a laser including beam splitter, being located between pump source and gain mediums, *such that pump radiation by the pump source passes by beam splitter before entering the gain medium*, which is neither anticipated or disclosed nor suggested in any piece of available prior art, which is neither anticipated nor obvious over the prior art of record.

### ***Response to Arguments***

Applicant's arguments filed April 23, 2008 have been fully considered but they are not persuasive. Applicant argues the prior art lack on page 6 – 9.

The applicant said;

"Spiekermann does not disclose or suggest each aspect of the presently claimed combination, as set forth in representative claim 1. For a first example, Spiekermann does not disclose or suggest that the pump source is arranged to optically pump *both the first and the second gain element*. Further for a second example, Spiekermann does not disclose or suggest that the first non-linear region for sum-frequency mixing and the second non-linear region for frequency doubling *are both located within the second (i.e. within the same) cavity*".

The examiner disagrees with the applicant's argument, since the prior art does teach or suggest claim 1 as claimed. Spiekermann discloses on Page 12, lines 34 – 36 said; "Although not shown in the figure, it is to be understood that the active media 101 and 102 of the respective laser are pumped by an optical pump source, is very clear Spiekermann device has a optical pump source arranged to optically pump first and second gain elements as stated in the rejection above. Spiekermann discloses on page 10, Lines 15 – 35 and page 11, lines 1 – 10 a first non-linear optical region (110)

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arranged for sum-frequency mixing. Spiekermann in view of Wu (Wu on Figure 3, (Column 1, Lines 40 – 66) and (Column 2, Lines 44 -48)) discloses on second non-linear region and second non-linear optical region arranged for frequency doubling. Wu discloses the fundamental laser beam present within the resonating cavity (which is one to two orders of magnitude higher than the fundamental beam outside of the cavity). By accessing, and operating on, and fundamental laser beam within the resonating cavity, the frequency conversion efficiency is increased, thereby giving rise to the generation of more powerful harmonic frequencies. The nonlinear crystals are inserted in the laser resonator in order to obtain third, fourth or even higher harmonic output.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Wu on Figure 3, (Column 1, Lines 40 – 66) and (Column 2, Lines 44 -48)) discloses on second non-linear region and second non-linear optical region arranged for frequency doubling. Wu discloses the fundamental laser beam present within the resonating cavity (which is one to two orders of magnitude higher than the fundamental beam outside of the cavity). By accessing, and operating on, and fundamental laser beam within the resonating cavity, the frequency conversion efficiency is increased, thereby giving rise to the generation of



more powerful harmonic frequencies. The nonlinear crystals are inserted in the laser resonator in order to obtain third, fourth or even higher harmonic output.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

In response to applicant's argument that to remedy this deficiency of Spiekermann, the Examiner relies on Wu. However, applicants respectfully submit that one of ordinary skill in the art, turning to Wu, would not find guidance to supplement the disclosure of Spiekermann and therefore would not arrive at the claimed invention. Wu aims towards producing high order harmonics in CW or low peak power pulse lasers. Wu discusses the use of at least two non-linear crystals within the resonating laser cavity. A first non-linear crystal is used for frequency doubling the fundamental frequency field, and a second non-linear crystal is used for sum-frequency mixing the fundamental frequency field with the frequency doubled field and applicants respectfully assert that there is no such reason to be found in the art, as the claimed pump is simply incompatible with the laser design presented in Spiekermann, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion

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of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

Applicant's arguments fail to comply with 37 CFR 1.111(b) because they amount to a general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references.

Applicant's arguments do not comply with 37 CFR 1.111(c) because they do not clearly point out the patentable novelty which he or she thinks the claims present in view of the state of the art disclosed by the references cited or the objections made. Further, they do not show how the amendments avoid such references or objections.

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

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extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Delma R. Fordé whose telephone number is (571) 272-1940. The examiner can normally be reached on M - F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Min Sun Harvey can be reached on (571) -272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Delma R. Fordé/

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/Minsun Harvey/

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